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(54) **Reinforcing bar coupling.**

(57) A coupling fitting for making joints in reinforcing bars or wires for structural concrete utilising a sleeve-like device, and means for locating it over and about the bars or wires comprising positively adjustable engagers (7) and profiled engagers (13) at radial spacings relative to the axis of the sleeve (1). The positively adjustable engagers are received in threading (5) which has a higher yield strength and/or hardness than the sleeve material. In one embodiment the threading is part of an insert (4) received in a hole (3) in the wall of the sleeve (1), in another embodiment the threading is formed directly in the sleeve and is subject to localised hardening.

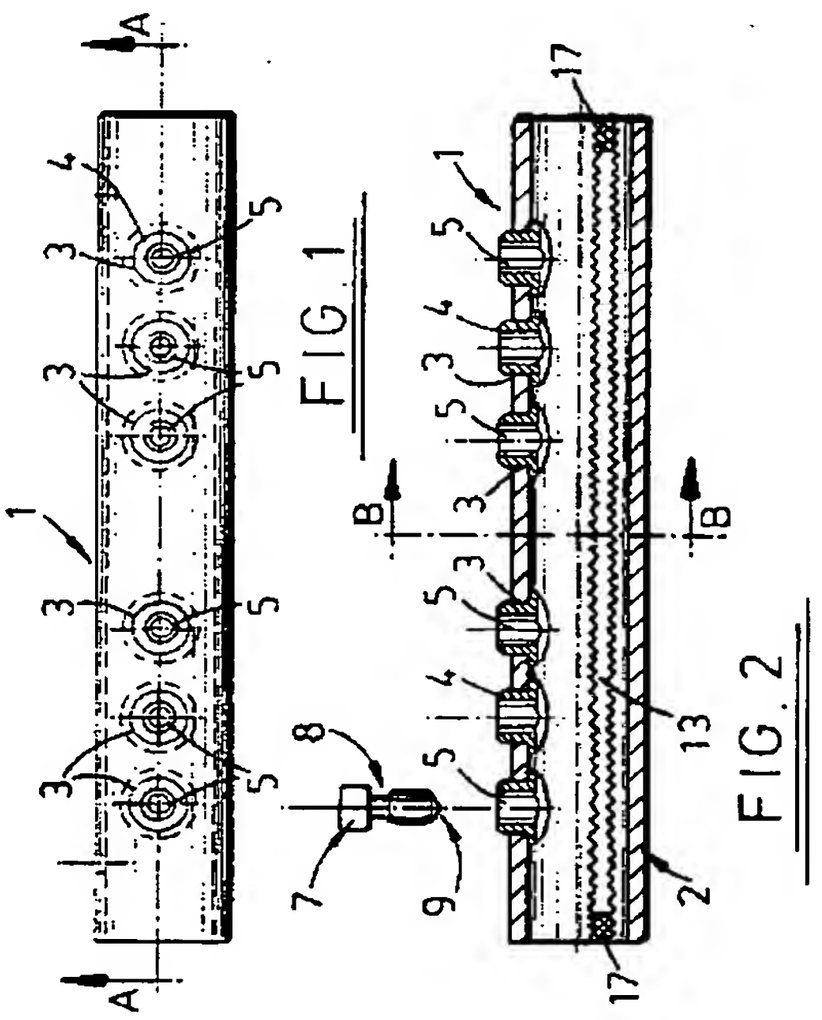

FIG. 1

FIG. 2

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The present invention relates to a reinforcing bar coupling.

In our Published British Patent specification No. 2220241 we describe a coupler for reinforcing bars which utilises a sleeve having threaded holes to receive correspondingly threaded engagers (bolts) which serve to join reinforcing bars in conjunction with radial spaced engagers which are ribbed to dig into the sleeve and reinforcing bars. By these means a mechanical coupling can be achieved which has a tensile strength at least equal to the ultimate tensile strength of the reinforcing bar. The wall thickness of the sleeve has to be sufficient to avoid canting of the bolts when the coupling is under tensile load. In addition the radial loading which can be imposed by the bolts is a function of the yield strength of the sleeve material and this determines how many bolts will be required to achieve a desired ultimate tensile strength. Previously we have utilised a vanadium HFS (hot finish sleeve tube) material for the sleeve.

The present invention arises from our endeavour to provide an equivalent strength of coupling at reduced cost.

Accordingly, the present invention provides a coupling fitting for making joints in reinforcing bars or wires for structural concrete, comprising a sleeve-like device having means for locating it over and about portions of said bars or wires adjacent said design joint with clearance to said bar or wire portions, wherein the means for locating comprises for each portion engagers at radial spacings relative to the axis of bars or wires to be joined, one of which engagers for each portion is positively adjustable at emplacement through the side wall of the device and the other engagers comprise radially spaced ribs which are profiled to key into at least the bars or wire portions, and in which the positively adjustable engager is received in threading of or associated with the sleeve and in which the threading has a higher yield strength than the sleeve material.

In one embodiment the sleeve has a hole which receives an insert having said threading. In another embodiment, threading formed directly in the sleeve and is subject to localised hardening. Usually there will be more than one positively adjustable engager employed for each portion and a respective threading for each. The number used is dictated by the size of the bars or wires being joined and the required tensile load. For couplers of equivalent tensile strength to those described in our above patent specification costs are reduced by using inserts which have a higher yield strength than the sleeve material, and by this means the sleeve material can have a lower material specification. For example yield strength may be reduced from say 460N/mm^2 to 360N/mm^2. For example HFS instead of vanadium HFS. The higher the yield strength of the insert, say with YS in the range 800 to 1000N/mm^2, allows higher bolt radial loads to be utilised and this in turn allows a smaller number of bolts to be utilised and therefore the sleeve length can be decreased. A further advantage arises from the ability to reduce the wall thickness of the sleeve without impairing the resistance to canting of the bolts by having the insert longer than the wall thickness of the sleeve. A preferred embodiment of insert has a cylindrical part to be received in the hole of the sleeve and an enlarged flange to one end having a shoulder which engages with an inner bore of the sleeve. The flange prevents the insert from pulling out under the action of the positive engager and also serves to stabilise the insert to further prevent canting. Alternatively, the enlarged flange may be dispensed with where the insert comprise a frusto-conical sleeve engaging with the correspondingly tapered hole of the sleeve. By this means there is a wedging action between the insert and the sleeve on introducing the positive engager.

In one embodiment we use an insert having a yield of 850 newtons per mm^2 and conveniently the flange has a major axis longer than its minor axis and in use the major axis is aligned with the longitudinal direction of the coupling.

The present invention will now be described further by way of example only with reference to the accompanying drawings, in which:-

Figure 1 is a plan view of a coupling according to the present invention,

Figure 2 is a cross section on A-A of Figure 1,

Figure 3 is a cross section on B-B of Figure 2,

Figures 4 and 5 are side and plan views of an insert as used in the coupling, and

Figure 6 is an end view of an alternative embodiment of sleeve.

Referring to the drawings of Figures 1 to 5, a coupling fitting for use in securing together ends of reinforcing bars or wires for subsequent embedment in structural concrete, comprises a tubular sleeve 1 having an internal diameter such as to fit about end portions of bars or wires in spaced relation thereto.

The sleeve is constructed symmetrically about its mid point and in the illustrated embodiment has, for each half, three holes 3 through the wall of the sleeve which receive a respective threaded insert 4 having a threaded bore 5 to receive positively adjustable engagers, in the form of threaded screws or bolts 7. The holes 3 are spaced along the length of the coupling. The inserts have a yield strength of at least 800N/mm^2 whilst the sleeve will have a lower yield strength typically less then 460N/mm^2 and more usually in the region of 360N/mm^2. The bolts are preferably cap screws and with a reduced shank as at 8 so that the head shears off at a predetermined torque on screwing them in place. The end of the bolt 7 is formed with indentation means 9 to penetrate into the bar or wires on doing up, either as a tapered point, or a convex or concave formation providing either a bit-

ing point or an annular biting edge. The bolts are hardened to 52 Rockwell C.

The inserts are illustrated further in Figures 4 and 5 and comprise a cylindrical sleeve portion 19 dimensioned to fit in the holes 3 as push fit and one end of the sleeve has an enlarged flange portion 21. In the illustrated embodiment the flange portion is generally elliptical with its major and minor axis dimensions larger than the diameter of the cylindrical portion 19 so as to provide a shoulder 22 which, when the insert is placed in the hole 3, engages against the inner wall of the sleeve. The major axis is aligned with the longitudinal axis of the coupling. In one embodiment the inserts are made from a material having a yield strength of the order of 850 newtons per mm^2 and the sleeve is made from a HFS specification material. It will be seen from Figure 2 that the length of the threaded holes 5 is greater than the wall thickness of the sleeve and this allows an increased radial loading to be employed on the bolts without the threads stopping whilst utilising a reduced wall thickness for the sleeve.

In the illustrated embodiment, two longitudinal ribs 13 are provided acting as radial engagers to which the bar or wire portions abut in use. The ribs are spaced apart circumferentially by angle A, preferably of the order of 120°. The ribs are positioned straddling the axis 15 of a positively adjustable engager 7 and in the opposite half of the sleeve. In the illustrated embodiment the ribs run substantially the length of the sleeve with soft tack welding 17 at each end which provides a convenient means of locating the ribs to the sleeve longitudinally and circumferentially during emplacement before doing up of the positively adjustable engagers. The ribs are profiled to both sides in the illustrated embodiment so as to key into the wires and the sleeve when tightening of the positively adjustable engagers.

In use the coupling sleeve is fitted over and about adjacent ends (butting up to one another for a straight sleeve) of the coupling bars or wires to be joined so centering the bars within the sleeve and causing the radial engagers to key into the bars, also the sleeve where the ribs are profiled to both sides. The ends of the positively adjustable engagers also bite into the bars. The bolts shear off at the outer surface of the sleeve at a torque determined to give required cooperating engagement of the engagers with the bar and/or sleeve. Such an arrangement provides the required mechanical strength. Increased radial loading of the bolts is made possible by the use of higher yield strength material for the inserts but this means the number of bolts required for each half of the coupling can be reduced for a given coupling strength. This also facilitates reduction of the length of the coupling.

The invention has been described with reference to straight put joint in which a straight sleeve is employed. This is probably the most common joint configuration, but the invention also extends to sleeve-like devices for coupling bars or wires at angles to one another by suitable configuration of the sleeve to receive appropriately orientated ends of bars or wires.

The arrangement of the combination of two profiled engagers (ribs) and positively adjustable engagers (bolts) may also be produced using a casting. A suitable end section is shown in Figure 6. In this case the sleeve threads 5' and the rib profiles 13' are integral with the sleeve 1' and are hardened to 52 Rockwell C units by induction heat treatment and water quenching. As an alternative to hardening the threaded holes, the aforedescribed inserts may be used as already described above.

Claims

1. A coupling fitting for making joints in reinforcing bars or wires for structural concrete, comprising a sleeve-like device having means for locating it over and about portions of said bars or wires adjacent said desired joint with clearance to said bar or wire portions, wherein the means for locating comprises for each portion engagers (7, 13) at radial spacings relative to the axis of bars or wires to be joined, one of which engagers (2) for each portion is positively adjustable at emplacement through the side wall of the device and the other engagers comprise radially spaced ribs (13) which are profiled to key into at least the bars or wire portions, characterised in that the positively adjustable engager is received in threading (5) of or associated with the sleeve and the threading has a higher yield strength than the sleeve material.

2. A coupling fitting as claimed in claim 1 in which there is more than one positively adjustable engager employed for each portion.

3. A coupling fitting as claimed in claim 1 or 2 in which the threading is formed directly in the sleeve material subject to hardening.

4. A coupling fitting as claimed in claim 1 or 2 in which the sleeve has a hole (3) which receives an insert (4) having said threading (5) into which the positively adjustable engager is threaded.

5. A coupling fitting as claimed in claim 4 in which insert (4) has a cylindrical part (9) to be received in the hole (3) of the sleeve (1) and an enlarged flange (21) to one end having a shoulder which engages with an inner bore of the sleeve.

6. A coupling fitting as claimed in claim 5 in which the flange is generally elliptical and its major axis

is aligned with the longitudinal axis of the sleeve.

7. A coupling as claimed in claim 4 or any one of claims 5 or 6 when appendant to claim 4 in which the insert comprises a frusto-conical sleeve engaging with a correspondingly tapered hole of the sleeve.

8. A coupling as claimed in claim 4 or any one of claims 5, 6 or 7 when appendant to claim 5 in which the insert has a length which is greater than the sleeve wall thickness.

9. A coupling as claimed in any one of the preceding claims in which the sleeve is positioned as a casting.

10. A coupling fitting as claimed in any one of the preceding claims in which the radially spaced ribs (13') are formed integrally with the sleeve and are hardened.

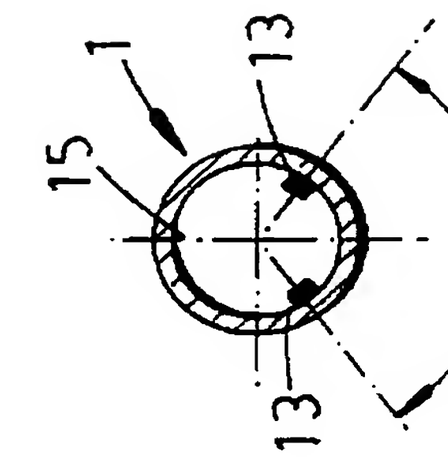

FIG.3

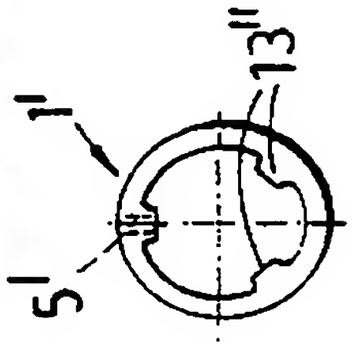

FIG.6

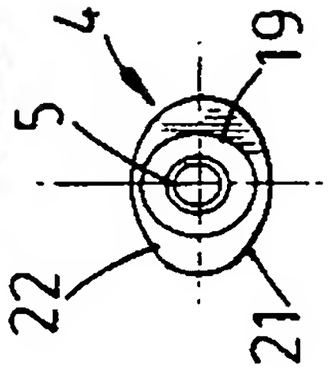

FIG.5

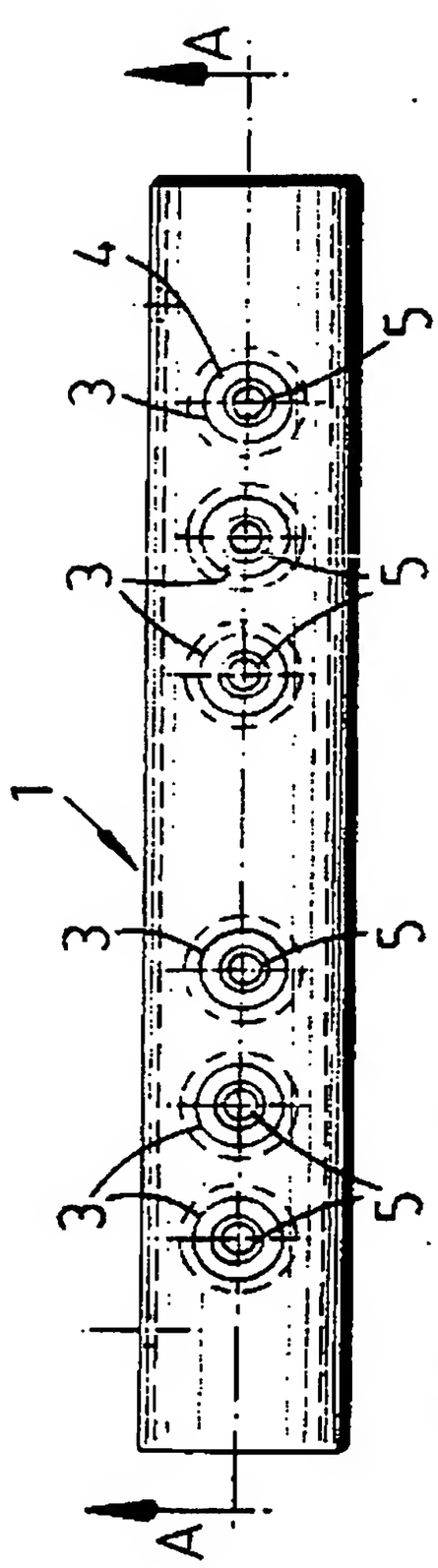

FIG.1

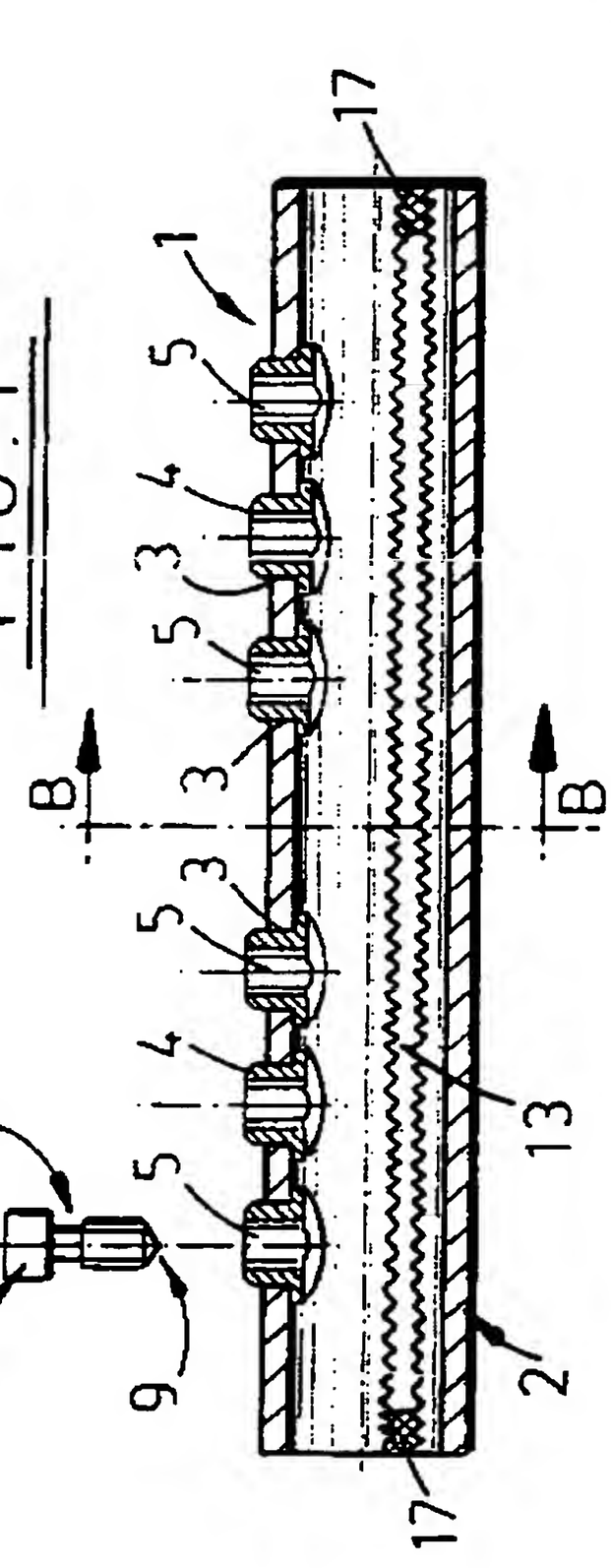

FIG.2

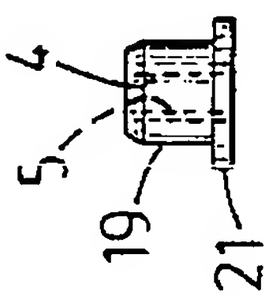

FIG.4